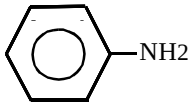
ANILINE

Aniline is a federal hazardous air pollutant and was identified as a toxic air contaminant in April 1993 under AB 2728.

CAS Registry Number: 62-53-3

Molecular Formula: C_6H_7N



Aniline is a colorless, oily liquid which darkens on exposure to air and light. It has a characteristic amine odor and burning taste. Aniline is miscible with alcohol, benzene, chloroform, carbon tetrachloride, acetone, and most organic solvents. Aniline also combines with acids to form salts and is combustible (Merck, 1983; HSDB, 1991).

Physical Properties of Aniline

Synonyms: benzenamine; aniline oil; phenylamine; aminobenzene; aminophen; kyanol; Blue oil

Molecular Weight:	93.12
Boiling Point:	184 - 186 °C
Melting Point:	-6.3 °C (solidifies)
Flash Point:	76 °C (169 °F) closed cup
Vapor Density:	3.22 (air = 1)
Density/Specific Gravity:	1.022 at 20/20 °C (water = 1)
Vapor Pressure:	0.489 mm Hg at 25 °C
Log Octanol/Water Partition Coefficient:	0.90
Water Solubility:	36,070 mg/L at 25 °C
Henry's Law Constant:	0.136 atm-m^3/mole at pH 7.3
Conversion Factor:	1 ppm = 3.8 mg/m^3

(Howard, 1990; HSDB, 1991; Merck, 1983; Sax, 1989; U.S. EPA, 1994a)

SOURCES AND EMISSIONS

A. Sources

Aniline is used in rubber accelerators and antioxidants, dyes and intermediates, photographic chemicals, as isocyanates for urethane foams, in pharmaceuticals, explosives, petroleum refining; and in production of diphenylamine, phenolics, herbicides and fungicides (Sax, 1987). Aniline is also used in the manufacture of polyurethanes, rubber processing chemicals, pesticides, fibers, dyes and pigments, photographic chemicals, and pharmaceuticals. It has also been found in

tobacco smoke, in effluents from oil shale recovery and oil refiners, and from chemical and coal conversion plants (HSDB, 1991).

The primary stationary sources that have reported emissions of aniline in California are national security installations (ARB, 1997b).

B. Emissions

The total emissions of aniline from stationary sources in California are estimated to be at least 4 pounds per year, based on data reported under the Air Toxics "Hot Spots" Program (AB 2588) (ARB, 1997b).

C. Natural Occurrence

Aniline is not a naturally-occurring product (Howard, 1990).

AMBIENT CONCENTRATIONS

No Air Resources Board (ARB) data exist for ambient measurements of aniline. However, the United States Environmental Protection Agency (U.S. EPA) has compiled data from 1979 to 1982 for three United States urban locations that reported mean ambient concentrations of aniline of 1.3 micrograms per cubic meter ($\mu g/m^3$) or 0.34 parts per billion (U.S. EPA, 1993a).

INDOOR SOURCES AND CONCENTRATIONS

No information about the indoor sources and concentrations of aniline was found in the readily-available literature.

ATMOSPHERIC PERSISTENCE

Aniline degrades in the atmosphere primarily by reaction with photochemically produced hydroxyl radicals. The estimated half-life for aniline is 2 hours. The half-life will be shorter during daylight hours, because of higher hydroxyl radical concentrations. The reaction products include nitrosamines, nitrobenzene, formic acid, nitrophenols, phenol, nitrosobenzene, and benzidine (Kao, 1994; Atkinson, 1995).

AB 2588 RISK ASSESSMENT INFORMATION

The Office of Environmental Health Hazard Assessment reviews risk assessments submitted under the Air Toxics "Hot Spots" Program (AB 2588). Of the risk assessments reviewed as of December 1996, aniline was not listed in any of the risk assessments (OEHHA, 1996a,b).

HEALTH EFFECTS

Probable routes of human exposure to aniline are inhalation, ingestion, and dermal contact (HSDB, 1991).

Non-Cancer: Aniline can cause methemoglobinemia. Acute effects from exposure may also include respiratory tract irritation and severe eye and skin irritation (U.S. EPA, 1994a). Chronic exposure can cause eye, nose, and throat irritation, anemia, weight loss, anorexia, and skin lesions (Sittig, 1991).

The U.S. EPA has established a Reference Concentration (RfC) for aniline of 0.001 milligrams per cubic meter based on spleen toxicity in rats. The U.S. EPA estimates that the inhalation of this concentration or less, over a lifetime, would not likely result in the occurrence of chronic non-cancer effects. An oral Reference Dose (RfD) for aniline has not been established (U.S. EPA, 1994a).

Limited information is available on adverse reproductive or developmental effects from exposure to aniline. Birth defects were observed in animals given aniline via gavage or injected directly into embryonic tissue (U.S. EPA, 1994a).

Cancer: The U.S. EPA has placed aniline in Group B2: Probable human carcinogen, based on sufficient evidence in animals but none in humans. The U.S. EPA has calculated an oral unit risk estimate of 1.6×10^{-7} (microgram per liter or μg/l)$^{-1}$. The U.S. EPA estimates that if an individual were to ingest water containing aniline at 6 μg/l, over an entire lifetime, that person would theoretically have no more than a 1 in 1 million increased chance of developing cancer (U.S. EPA, 1994a). The International Agency for Research on Cancer has placed aniline in Group 3: Not classifiable (IARC, 1987a).

The State of California under Proposition 65 has determined that aniline is a carcinogen (CCR, 1996). The inhalation potency factor that has been used as a basis for regulatory action in California is 1.6×10^{-6} (microgram per cubic meter)$^{-1}$ (OEHHA, 1994). In other words, the potential excess cancer risk for a person exposed over a lifetime to 1 μg/m^3 of aniline is estimated to be no greater than 1.6 in 1 million. The oral potency factor that has been used as a basis for regulatory action in California is 5.7×10^{-3} (milligram per kilogram per day)$^{-1}$ (OEHHA, 1994).